BRUSH HOLDER FOR AN ELECTRICAL MACHINE

[0001] Prior Art

[0002] The present invention relates to a brush holder for an electrical machine, and in particular to a brush holder for an electric motor for power tools.

[0003] Brush holders for electrical machines are known in manifold forms from the prior art. For instance, in universal electric motors of the kind typically used in power tools, such as right-angle sanders, power drills, and the like, the necessary current reversal (commutation) is effected with the aid of a commutator. The transmission of the current to the commutator is done by means of carbon brushes. These carbon brushes are disposed in a brush holder, which must furnish exact guidance of the brush and a necessary, metered contact pressure. From Swiss Patent Disclosure CH 493 115, a brush holder is known in which prestressing is exerted on the brushes by means of a spring tongue and a tension spring. Between the brush and the pressure tongue, a cylindrical contact-pressure member is provided, which presses into a V-shaped notch in the carbon brush, in order to exert a uniform contact pressure on the brush.

[0004] Advantages of the Invention

[0005] The brush holder of the invention having the characteristics of claim 1 has the advantage by comparison that it can be secured especially simply to an electrical machine. For that purpose, according to the invention, a securing element is provided which essentially has

a T shape. As a result, a firm and exact seat of the brush holder with minimized inducement to vibration can be attained. The T-shaped securing element can simply be thrust against a suitably formed receptacle, so that no fastening screw or the like is necessary. Moreover, openings in the region of the electrical machine can be reduced as a result, so that an improvement in the rigidity of the electrical machine can be attained.

[0006] The dependent claims demonstrate preferred refinements of the invention.

[0007] Especially preferably, the securing element has two essentially T-shaped elements, which are disposed on the brush holder on its diametrically opposed ends.

[0008] To make it especially economical to produce, the T-shaped securing element is formed in one piece with the housing of the brush holder. Especially preferably, the housing of the brush holder is made from two sheet-metal strips which are reshaped by means of reshaping such that they form the housing with integrally formed securing elements. Each housing part then preferably forms one leg of the T-shaped securing element. Alternatively, the housing may be formed in one piece. To that end, a sheet-metal strip is reshaped to suit a desired external housing shape, and then a slot is made in the unshaped sheet-metal strip. The sheet-metal strip is then bent over along the slot and widened, so that a receiving chamber for the brush is formed.

[0009] The prestressing element is preferably retained on the electrical machine and thus is not secured to the housing of the brush holder. As a result, no prestressing forces are exerted on the housing of the brush holder, and moreover, an inclination of the housing of the brush

holder, which is typically made of metal, to melt out from a plastic holder on the electrical machine is greatly reduced. Moreover, securing the prestressing element to the electrical machine makes it possible for the housing of the brush holder to be fixed in its position by the prestressing element.

[0010] Preferably, a prestressing element of the brush holder is embodied as a spring, and especially preferably, the spring is disposed outside the housing. A spring arm exerts the prestressing on the brush through a recess formed in the housing of the brush holder. As a result, the introduction of spring force, or in other words the contact point with the brush, can be located centrally on the brush, so that a uniform distribution of force is brought about at the bracing points of the spring.

[0011] Moreover, by disposing the spring element outside the housing of the brush holder, the spring is located relatively far away from a heat introduction point at the contact point with the brush, and thus the spring can be well cooled.

[0012] Especially simple fastening of the spring is possible if the spring has two V-shaped spring ends. Especially preferably, the V-shaped spring ends are guided via the base or strut of the T-shaped securing elements.

[0013] To achieve even better cooling of the spring, on the side of the housing of the brush holder where the spring is located, the surface of this side is embodied in undulating fashion, so that only a few contact points exist between the housing and the spring, and the carbon

brush continues to move smoothly in the quiver, even if it becomes soiled. As a result, a cooling air flow can be conducted between the spring and the housing.

[0014] The brush holder of the invention is especially preferably used in electric motors for power tools, since because of the large numbers in which such tools are manufactured, the cost advantages become especially valuable.

[0015] Moreover, the above-described spring can be mounted especially simply by snapping the spring onto the brush holder receptacle of the motor housing, pivoting the spring ends over, and clipping them into recesses provided on the housing of the electric motor.

[0016] Drawings

[0017] In the drawing:

[0018] Fig. 1 is a perspective view of a brush holder in an exemplary embodiment of the invention;

[0019] Fig. 2 is a perspective view of the brush holder shown in Fig. 1, seen from the opposite side compared to Fig. 1;

[0020] Fig. 3 is a perspective view of a mounted brush holder in an electric motor;

[0021] Fig. 4 is a perspective view of the fastening of the brush holder of the invention in the receptacle of the electric motor housing; and

[0022] Fig. 5 is a perspective view of a spring in the mounted state, with other components not shown.

[0023] Description of the Exemplary Embodiment

[0024] Below, referring to Figs. 1 through 5, a brush holder 1 in a first exemplary embodiment of the present invention will be described. As shown in Fig. 1, the brush holder 1 includes a housing 2 as well as a spring 7 as a prestressing element. The spring 7 is disposed outside the housing 2. The housing 2 comprises two parts 2a and 2b, which can be made from stamped metal sheets. By reshaping, the two housing parts 2a, 2b are designed such that one T-shaped securing element 3 and 5 each is formed on the left and right ends. The T-shaped securing elements 3, 5 are each joined to the housing 2 via the base of the T-shaped securing element. At the base of the T-shaped securing element, connecting tabs 4, 6 (see Fig. 1) are embodied, for joining the two housing parts 2a, 2b firmly to one another. Each free leg of the T-shaped securing element 3 is formed by a respective housing part 2a, 2b, and the base of the T-shaped securing element is formed by both housing parts 2a, 2b. The housing 2, which in its interior receives a carbon brush 11, is thus formed. Alternatively, the housing 2 may also be formed in one piece, by reshaping a metal sheet to suit the desired outer design and then making a slot, closed on both ends, in the metal sheet. The metal sheet is then pivoted over along the slot and upset, in order to form the receiving chamber for the brush. The connecting struts 4, 6 were then the ends of the closed slot. To form the T-shaped securing elements 3

and 5, the metal sheet was also slotted before being pivoted over, and the slots were located on a line that also forms the pivot axis.

[0025] The carbon brush 11 is prestressed by the spring 7, so that as shown in Fig. 3, it can be pressed against a rotor of an electrical machine. To that end, a spring arm 8 is embodied on the spring 7 and through a recess 12 formed in the housing 2, this arm exerts a prestressing force on the carbon brush 11. As seen particularly from Figs. 1 and 5, the spring arm 8 is formed in the middle of the helical spiral spring 7, by rolling one counterclockwise and one clockwise coil of the spring 7 onto both sides of the two-legged spring arm 8. As also seen from Figs. 2 and 3, the spring 7 is moreover embodied with V-shaped ends 9 and 10. The V-shaped ends 9, 10 of the spring 7 are guided via the base of the T-shaped securing elements 3, 5 and the connecting tabs 4, 6 in such a way that the connecting tabs 4, 6 are located at the kink point of the V-shaped ends 9, 10. Bent ends 22, 23 are additionally embodied on the outermost end piece of each end 9, 10 and engage the recesses (see Fig. 4) on the inside of the brush holder receptacle 15.

[0026] A brush terminal 13 and a terminal 14 for a field winding, both embodied as plug-in terminals (see Figs. 1 and 2), are also provided on the brush holder 1, integrally with the housing 2.

[0027] As shown in Figs. 3 and 4, the brush holder 1 of the invention is thrust into a holder 15 on the electric motor housing and fixed. The fixation on the holder 15 is effected on the one hand via the T-shaped securing elements 3 and 5, which are introduced into a respective T-shaped slot 16 and 17 (see Fig. 3). The brush holder 1 is also secured to the holder 15 by

means of the spring 7. More precisely, two tabs 18 and 19 (see Fig. 3) and two recesses 20, 21 (see Fig. 4) are provided on the holder 15. On the one hand, the outermost ends 22 and 23 of the spring 7 engage the recesses 20 and 21, and on the other, the transition between the V-shaped regions 9 and 10 and the spiral spring regions of the spring 7 are held by the tabs 18 and 19. Since the spring 7 is embodied symmetrically, a centered force can act on the carbon brush 11.

[0028] The spring 7 is thus held at only four points on the holder 15 of the electric motor, namely at the two tabs 18 and 19 and the two recesses 20 and 21.

[0029] The spring 7 can be secured to the holder 15 of the electric motor simply by clipping it in place and then pivoting over the V-shaped ends. The brush holder 1 is thus held on the holder 15 on the one hand by the T-shaped securing elements 3 and 5 and on the other by the spring 7 itself. As a result, a firm and exact fixation of the brush holder in the motor housing can be attained. Hence the spring 7 has a dual function, namely that of the prestressing element of the carbon brush 11 and the function of fixation of the housing 2 of the brush holder. Thus with a minimum number of components, the housing 2 can be prevented from falling out of the T-shaped slots 16, 17 in the holder 15.

[0030] Also according to the invention, the spring 7 is disposed outside the housing 2 and thus at a certain distance from the carbon brush 11. As a result, the cooling air for the motor can cool these thermally severely stressed components of the brush holder 1 well. Moreover, as shown particularly in Figs. 1 and 2, the housing side 2a on the outside of which the spring 7 is located is embodied in undulating fashion, so that a cooling air flow can develop very

well between the housing wall and the spring 7. As a result, additional cooling of the spring 7 can be achieved.

[0031] Thus the brush holder 1 of the invention assures an exact and at the same time also sturdy guidance of the carbon brush 11 and furthermore has an especially compact construction. The openings in the housing of the electric motor for the brush holder should be made as small as possible, so that an increased rigidity of the motor housing can be achieved. The symmetrical embodiment of the spring 7 furthermore furnishes a linearly variable spring force that acts on the carbon brush 11, so that especially uniform commutation conditions can be achieved, as the brush mass of the electric motor decreases. Hence an improved brush service life can be achieved in comparison to the prior art, and a brush holder 1 can be furnished which can be produced and mounted especially economically. The brush holder 1 has a very small structural size with a reduced number of parts.